

National Voluntary
Laboratory Accreditation
Program



U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards

Concrete LAP Handbook

OPERATIONAL AND TECHNICAL REQUIREMENTS
OF THE
LABORATORY ACCREDITATION PROGRAM
FOR
FRESHLY MIXED FIELD CONCRETE

NBSIR 85-3140

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
Office of Product Standards Policy
Gaithersburg, Maryland 20899

April 1985



**CONCRETE LAP HANDBOOK
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April 1985

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- NVLAP Accreditation Criteria (December 1984)
- NVLAP Lab Bulletin No. 3A

I. THE CONCRETE LAP AT A GLANCE

This document explains the operation and technical requirements of the Laboratory Accreditation Program (LAP) for Freshly Mixed Field Concrete (Concrete LAP). All of the steps leading to accreditation are discussed. Technical requirements are explained indicating how the NVLAP criteria are applied.

The Concrete LAP was established in 1979 in response to a request from the private sector. The purpose of the program is to (1) upgrade the proficiency of personnel conducting tests on freshly mixed concrete and (2) give recognition to competent laboratories.

Test Methods Covered: ASTM C31, C172, C143, C138, C231, C39, C172.

Period of accreditation: One year

On-site assessment performed by: Cement and Concrete Reference Laboratory (CCRL)

On-site assessment frequency: Approximately two and one-half years

Proficiency testing: Calculation of within laboratory coefficients of variation

Fees: Annual administrative fee, on-site assessment fee when performed.

II. INTRODUCTION

Background

The U.S. Department of Commerce, National Bureau of Standards (NBS) administers the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP's function is to accredit public and private testing laboratories based on evaluation of their technical qualifications and competence for conducting specific test methods in specified fields of testing. Accreditation is granted on the basis of conformance with criteria published in the Code of Federal Regulations as part of the NVLAP procedures (15 CFR Part 7). (See Appendix.)

This document is intended for use by staff of accredited laboratories, those seeking accreditation, other laboratory accreditation systems, and others needing information on the requirements for NVLAP accreditation under this LAP. This document is generally included in the NVLAP Application Package along with General Application Forms, Test Method Selection Lists, and other materials needed to apply for or renew accreditation. It presents the administrative and operational procedures and technical requirements of the LAP and should be retained and be readily accessible to laboratory personnel.

NVLAP Accreditation

Accreditation is granted only after thorough evaluation of the applicant has demonstrated that all NVLAP criteria have been met. The accreditation is formalized through issuance of a Certificate of Accreditation, Scope of Accreditation and publicized by announcement in various government and private media.

NVLAP accreditation is available to commercial laboratories, manufacturer's in-house laboratories, university laboratories, Federal, State, and local government laboratories. Foreign-based laboratories may also be accredited by NBS if they meet the same requirements as domestic laboratories and pay any additional fees required.

Why NVLAP Accreditation ?

The reasons why a laboratory may wish to be accredited include: legal requirements such as regulations or codes, contract specifications, and the desire to be recognized as being demonstrably competent to meet the needs of its clients.

For accreditation to be meaningful, it must be granted by a clearly credible organization. NVLAP provides an unbiased third party evaluation and recognition of performance as well as expert technical assistance to upgrade laboratory performance.

Testing Laboratory Defined

NVLAP defines a "testing laboratory" as an organization that provides services to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of products or systems.

Accreditation Defined

NVLAP accreditation means recognition of a testing laboratory's competence to perform specific test methods in specified fields of testing. It means that the laboratory's quality system, staff, facilities and equipment, calibration procedures, test methods and procedures, records, and test reports, have been evaluated and found to meet NVLAP criteria. NVLAP accreditation does not mean a guarantee (certification) of laboratory performance or product test data; it is a finding of laboratory competence.

For further information about NVLAP, or assistance in understanding and meeting the NVLAP requirements and criteria, please write or call:

NVLAP
National Bureau of Standards
ADMIN A531
Gaithersburg, MD 20899

Phone: 301-921-3431

III. ADMINISTRATIVE AND OPERATIONAL REQUIREMENTS

LABORATORY CODE NUMBER

Each participating laboratory is assigned a four-digit laboratory code number. The code number is used by the NVLAP staff for identification, filing, recordkeeping, and database management. Participants are requested to put their Lab Code number on all correspondence with NVLAP.

ACCREDITATION PERIOD

Accreditation is granted for a period specified in the LAP **Application Package** (usually one year). The accreditation period begins on one of four dates: January 1, April 1, July 1, or October 1. Once a laboratory has been assigned an accreditation date, it retains that date as long as it remains in the program. Accreditation expires and is renewed on that date.

RENEWAL

Each participating laboratory will be sent a renewal **Application Package**, well in advance of the expiration date of its accreditation, to allow sufficient time to complete the renewal process. The renewal application contains the same forms used for initial application, and the laboratory need only indicate where changes have occurred from the previous period in personnel, equipment, facilities, or the scope of accreditation desired.

With the exception of an initiation fee for new applicants, the technical requirements and fees are the same as for initial accreditation. The application and fees must be received by NBS prior to expiration of the laboratory's current accreditation to avoid a lapse in accreditation.

PUBLICIZING ACCREDITATION STATUS

BY NVLAP

NVLAP publishes an annual Directory of Accredited Laboratories. The Directory contains the name and address, scope of accreditation, contact person, and the accreditation renewal date for each accredited laboratory. Supplements to the Directory are published quarterly to cover interim accreditation actions including initial accreditations, renewals, suspensions, terminations, and revocations. The Directory is distributed nationally and internationally to manufacturers, suppliers, retailers, professional and trade associations, code groups, and government agencies.

Note: Administrative and operational requirements presented here are generally applicable to all NVLAP programs. Technical and proficiency requirements are specifically applicable to this LAP.

BY LABORATORIES

Accredited laboratories are encouraged, within specified limits, to publicize their accredited status. The major restriction is that advertising must not imply product certification by NBS or the U.S. Government. Laboratories and their clients may not reference their accredited status in consumer media, in product advertising, or on product labels, containers or packaging.

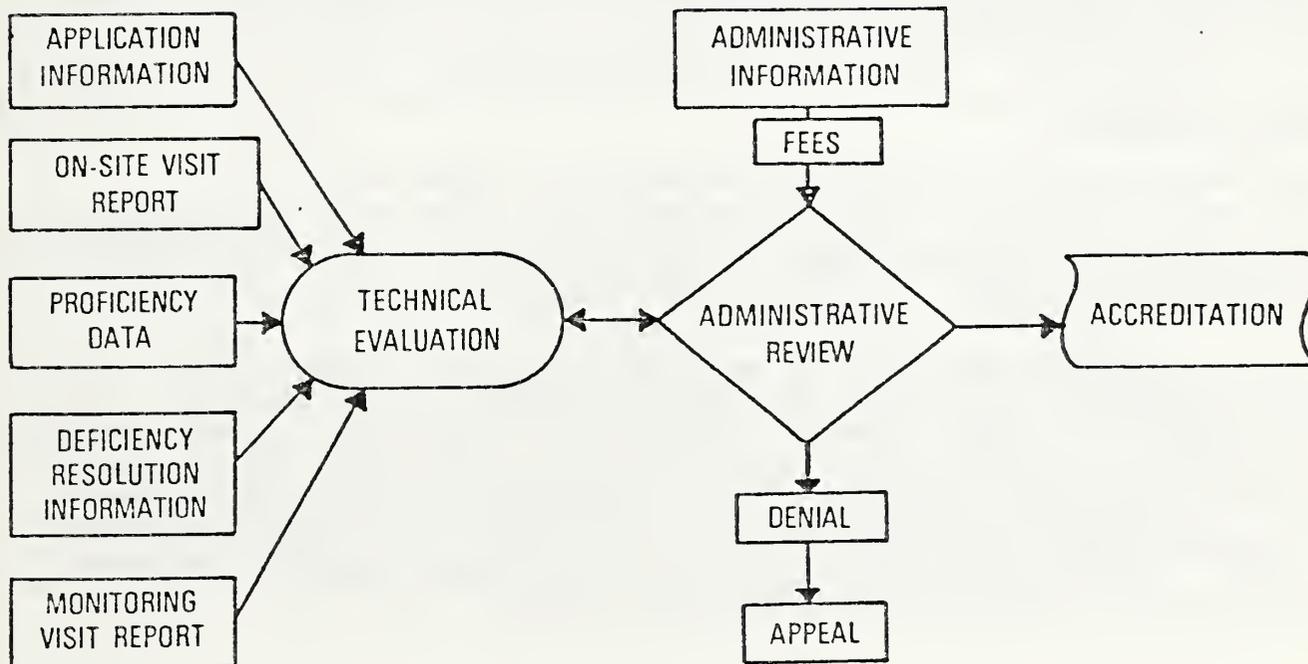
A laboratory may cite its accredited status and use NVLAP logos on reports, stationery, and in business and trade publications provided that it is clearly indicated that it is the laboratory which is accredited. NVLAP Lab Bulletin No. 3A provides more detailed guidance on how a laboratory may publicize its accredited status and the statements which may be made. (See Appendix.)

COMPLIANCE WITH EXISTING LAWS

Accreditation does not relieve the laboratory of the need to observe and comply with existing Federal, State, and local statutes, ordinances, or regulations that may be applicable to its operations, including consumer protection and antitrust laws.

ACCREDITATION PROCESS

Accreditation is granted following successful completion of a process which includes submission of an application and payment of fees by the laboratory, an on-site assessment, resolution of deficiencies identified during the on-site assessment, participation in proficiency testing, technical evaluation, and administrative review. A diagram of the accreditation process is shown in the figure below.



APPLICATION AND FEES

An Application Package is sent to a laboratory on request. It includes: General Application Forms, a Fee Calculation Sheet, and this document. The General Application Form must be completed and signed by an authorized representative of the laboratory. The authorized representative is one who can act on behalf of the laboratory and commit it to fulfill the NVLAP requirements. Before completing and signing the application, the authorized representative should review all documents and become totally familiar with NVLAP requirements. Although other laboratory staff may be designated to perform activities, such as handling proficiency testing or receiving an assessor, the authorized representative is the only one who can authorize a change in the scope or nature of the application.

In general, the accreditation fee is composed of several parts, some of which are fixed while others depend on the scope of accreditation desired and the specifics of the LAP. The total accreditation fee must be paid before accreditation can be granted. The individual parts of the accreditation fee include, as appropriate: a one-time LAP initiation fee for new applicants, an administrative fee, test method fees, an assessment fee, and proficiency testing fees. The fees for this LAP are shown in the Fee Calculation Sheet included in the LAP Application Package.

In the Concrete LAP, the on-site assessment fee is paid directly to the ASTM. Since the visits are not synchronized with the accreditation period, a laboratory will be billed as required (approximately every two and one-half years). When due, this fee must be promptly paid.

The laboratory will be scheduled for an on-site assessment after payment of all required fees and will be notified of any additional information which must be supplied and of any applicable proficiency testing requirements which must be completed for the technical evaluation.

APPROVED SIGNATORY

Under NVLAP criteria, an accredited laboratory must have one or more individuals or laboratory positions designated as having responsibility for signing "all test reports endorsed with the NVLAP logo." This is the person(s) to whom NVLAP, laboratory clients, or others would go in case of questions or problems with the report.

There is no formal requirement for nomination or approval of persons or laboratory positions designated as approved signatories. The laboratory should inform NVLAP of its appointments by completing the appropriate sections in the application for accreditation. Approved signatories should be: persons or positions with adequate responsibility or authority within the organization, with adequate and appropriate technical capabilities, and without conflict of interest. The approved signatory may be the authorized representative who is responsible for signing the NVLAP Application Form.

Laboratory test reports carrying the NVLAP logo need not be signed individually by the approved signatory. Test report forms may be preprinted with the required information. Forms that are electronically or computer generated may have the information printed along with the test results.

INSPECTORS

The inspectors who conduct on-site assessments in the Concrete LAP are employees of the ASTM/NBS sponsored Cement and Concrete Reference Laboratory (CCRL). These individuals are hired and trained by the CCRL to be inspectors of concrete testing laboratories.

TECHNICAL EXPERTS

In addition to inspectors, NVLAP uses Technical Experts (TEs) as assessors and evaluators. These are individuals knowledgeable in the testing field being evaluated. They may be engineers or scientists currently active in the field, consultants, college professors or retired persons. They are selected on the basis of their professional and academic achievements, experience in the field of testing, management experience, and tact in dealing with people. Their services are generally contracted as required; they are not NVLAP staff members.

Assessors are TEs selected to conduct an on-site assessment of a particular laboratory on the basis of how well their individual experience matches the type of testing to be assessed, as well as absence of conflicts of interest. The laboratory has the right to appeal the assignment of an assessor and may request an alternate.

Evaluators are TEs selected to review the record of the laboratory as a whole, including the application, assessment report, deficiencies, corrections to deficiencies, and proficiency test results and, based on this record, to recommend whether or not a laboratory should be accredited. The evaluators are matched to the type of testing being evaluated and are selected to avoid conflicts of interest.

ON-SITE ASSESSMENT

Before initial accreditation and periodically thereafter, an on-site assessment of each laboratory is conducted to determine compliance with the NVLAP criteria. The assessment is usually conducted by a CCRL inspector, but are sometimes conducted by one or more NVLAP assessors selected on the basis of their expertise in the field of testing to be reviewed. Both assessors and inspectors use checklists developed by NVLAP so that each laboratory receives an assessment comparable to that received by others. However, assessors have considerable latitude to make judgments about a laboratory's compliance with the NVLAP criteria, depending on the assessor's experience and the unique circumstances of the laboratory.

Normally, arrangements for the on-site visit are made directly by CCRL with laboratories applying for NVLAP accreditation. As scheduling permits, the CCRL will conduct an initial visit to an applicant laboratory within six (6) months of application for NVLAP accreditation and thereafter on approximately a 2 1/2 year cycle. In cases where a laboratory wishes to expedite an accreditation request, it may be possible to arrange a special on-site visit for an additional fee.

If a laboratory has subscribed to the CCRL inspection service prior to seeking NVLAP accreditation, an on-site visit may not be required for initial accreditation. When a laboratory has undergone a regular CCRL inspection within two years prior to applying for accreditation, the results of that inspection will be accepted in lieu of an additional on-site visit provided that the laboratory:

- authorizes NVLAP staff and technical experts to review that CCRL report;
- provides evidence that all deficiencies noted in the CCRL report have been corrected;
- agrees to undergo a CCRL/NVLAP on-site visit on its next regularly scheduled on-site date; and
- completes a questionnaire which elicits information on NVLAP requirements which were not addressed by the CCRL inspection.

The time needed to conduct an assessment varies, but two days is the norm. Every effort is made to conduct an assessment with as little disruption as possible to the normal operations of the laboratory. During the assessment the assessor will carry out the following functions:

- meet with management and supervisory personnel responsible for the laboratory's activities (for which accreditation is being sought) to review the assessment process with the individuals involved and to set the assessment agenda.
- examine the quality assurance system employed by the laboratory. The assessor may select and trace the history of one or more samples from receipt to final issuance of test reports. The assessor will conduct a thorough review of the laboratory's quality manual or equivalent, evaluate the training program, examine notebooks or records pertaining to the samples, check sample identification and tracking procedures, determine whether the appropriate environmental conditions are maintained, and examine copies of completed test reports.
- review records of periodic internal audits, use of check samples or participation in round robin testing or other similar programs.
- review personnel records including resumes and job descriptions of key personnel, competency evaluations for all staff members who routinely perform the testing for which accreditation is sought, calibration or verification records for apparatus used, test reports, and sample control records.

- observe demonstrations of testing techniques and discuss them with the technical personnel to assure their understanding of the procedures.
- examine major equipment, apparatus, and facilities.

At the conclusion of the assessment, the assessor will conduct an exit briefing to discuss his or her observations with appropriate laboratory staff and call attention to any deficiencies uncovered.

Notification of On-site Visit Results

CCRL Report:

The laboratory will receive a written report from the CCRL detailing the results of the on-site visit for all areas for which the laboratory was inspected. This will be the regular report as issued by the CCRL for a normal inspection. The report should be received within 90 days of the inspection.

NVLAP Deficiency Letter:

If the on-site inspection reveals deficiencies that pertain to the NVLAP requirements, NVLAP will send a letter describing the specific items to the laboratory.

If deficiencies have been noted, the laboratory must, within 30 days of the date of this notification provide NVLAP with documentation or certification, by the authorized representative, that the specified deficiencies have been corrected or that specific actions are being taken to correct the deficiencies.

A laboratory applying for initial accreditation may request an extension to complete required corrections.

If any deficiencies are noted at laboratories which are currently accredited, such deficiencies must be corrected within 30 days after notification or the laboratory may face possible revocation, suspension, or expiration of its accreditation. Any test equipment that is identified as out-of-calibration, should not be used until corrective action has been completed. All deficiencies noted for corrective action will be subject to thorough review and verification during subsequent assessments and technical evaluations.

MONITORING VISITS

In addition to regularly scheduled assessments, monitoring visits may be conducted by assessors or by NBS staff at any time during the accreditation period. Monitoring visits may occur for cause or on a random selection basis. These visits serve to verify reported changes in the laboratory's personnel, facilities, and operations or to explore possible reasons for poor performance in proficiency testing.

The scope of a monitoring visit may range from checking a few designated items to a complete review. Failure to cooperate with NVLAP assessors will be grounds for initiation of adverse accreditation action. No additional fee is required for the monitoring visit.

PROFICIENCY TESTING

Proficiency testing is an integral part of the NVLAP accreditation process. Demonstration of appropriate facilities, equipment, personnel, etc. is essential, but may not be sufficient for the evaluation of laboratory competence. The actual determination of test data using special proficiency testing samples provides NVLAP with a way to determine the overall effectiveness of the laboratory.

Proficiency testing is a process for checking actual laboratory testing performance, usually by means of interlaboratory comparisons. Each LAP has unique proficiency testing requirements. The data is analyzed by NVLAP and summary reports of the results are sent back to the participants.

For many test methods, results from proficiency testing are very good indicators of a laboratory's testing capability. Information obtained from proficiency testing helps to identify problems in a laboratory. When problems are found, NVLAP staff members work with the laboratory staff to solve them. If problems with the test method are suspected, NVLAP provides information to the appropriate standards-writing bodies.

The specific proficiency testing requirements for this LAP are included in Section V of this document.

TECHNICAL EVALUATION

After a laboratory has completed all the technical requirements of a LAP and is ready for an accreditation action, a final technical evaluation is conducted by experts chosen for their experience and knowledge of the pertinent test methods. They review records on each applicant laboratory and base their evaluation on:

- information provided on the application;
- on-site assessment reports;
- actions taken by the laboratory to correct deficiencies;
- results of proficiency testing; and
- information from any monitoring visits of the laboratory.

If the technical evaluation reveals additional deficiencies, written notification describing them will be made to the laboratory. The laboratory must respond within 30 days of such notification and provide documentation or certification by the authorized representative that the specified deficiencies have been corrected. Clarification of some issues may be requested by telephone. All deficiencies must be corrected before accreditation can be granted or renewed.

ADMINISTRATIVE REVIEW

After the technical evaluation has been completed, the NVLAP staff prepares an administrative recommendation that the laboratory either be granted or denied accreditation. This recommendation is based on a review of the technical evaluation and other records to ensure that all NVLAP technical, financial and administrative obligations have been satisfied.

ACCREDITATION ACTIONS

Acting for the Director of NBS, the Director of the NBS Office of Product Standards Policy makes the following decisions.

Accreditation If accreditation is recommended, the recommendation forms the basis for granting accreditation. A Certificate of Accreditation will be issued to the laboratory.

Denial If denial is recommended, the laboratory is notified of a proposal to deny accreditation and the reason(s) therefor.

Suspension If a laboratory is found to have violated the terms of its accreditation, the accreditation can be suspended. The laboratory will be notified of the reasons for and conditions of the suspension and the action(s) that the laboratory must take to have accreditation reinstated.

Revocation If a laboratory is found to have violated the terms of its accreditation, the laboratory is notified of a proposal to revoke accreditation and the reasons therefor. The laboratory may be given the option of voluntarily terminating accreditation. If accreditation is revoked, the laboratory must return its Certificate of Accreditation and cease use of the NVLAP logo on any of its reports, other correspondence, or advertising.

If denial or revocation has been proposed, the laboratory may request a hearing, under United States Code 5 U.S.C. 556, within 30 days of the date of receipt of the notification. If a hearing is not requested, the action becomes final upon the expiration of that 30-day period.

After a participant's accreditation has been terminated, whether voluntarily or through adverse action, the accreditation certificate must be returned to NVLAP. If a laboratory elects not to renew or wishes to voluntarily terminate its accreditation at any time, the notification of such intention should be forwarded to NBS in writing.

IV. TECHNICAL REQUIREMENTS

The requirements discussed in this section interpret the NVLAP criteria for application to the Concrete LAP. These requirements do not supersede the published NVLAP criteria, which are included in the Appendix.

SCOPE OF THE LAP

The scope of this LAP involves concrete testing in accordance with the test methods (most recent edition published) shown. For the purpose of accreditation the tests are arranged in two groups. These are:

(1) The FIELD GROUP which contains test methods:

ASTM C31	Making and Curing Concrete Test Specimens in the Field
ASTM C172	Sampling Fresh Concrete
ASTM C143	Slump of Portland Cement Concrete
ASTM C138	Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
ASTM C231	Air Content of Freshly Mixed Concrete by the Pressure Method

(2) The FIELD AND LABORATORY GROUP which contains the same five methods plus:

ASTM C39	Compressive Strength of Cylindrical Concrete Specimens
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The following test method is optional and may be included at no extra charge as part of either group:

ASTM C173	Air Content of Freshly Mixed Concrete by the Volumetric Method
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Accreditation is granted by Test Group only, not for individual methods. A laboratory may select either group, with or without ASTM C173. Competence must be demonstrated for all test methods within a selected group in order to be accredited for the group.

QUALITY ASSURANCE SYSTEM

The key for proper functioning of an organization is establishment and maintenance of a system of procedures and practices to assure the quality of its services. In order to qualify for accreditation, a testing laboratory must demonstrate that its quality systems ensure the technical integrity of its work.

DOCUMENTATION

A laboratory must have up-to-date documentation which thoroughly describes all its procedures and practices. The written descriptions should contain such items as the method of implementation, responsible personnel, recordkeeping system, operating procedures, procedures to employ in the event of unusual or non-standard circumstances, and scheduling. Written descriptions should include at least the following topics:

- Organizational chart;
- Laboratory facility and scope of services offered;
- Duties of key personnel;
- Personnel training procedures;
- Personnel competency assurance;
- Test equipment inventory;
- Test equipment calibration, verification, and maintenance practices;
- Specimen handling, control, and identification;
- Actions concerning damaged specimens;
- Data handling and reporting; and
- Actions when variations in test data indicate a problem exists.

The documentation may be in the form of a manual or may be individual sheets in various locations throughout the laboratory. If individual sheets are used, a central reference document must be available to indicate where the sheets may be found. The documentation must be in a format and style which can be easily understood by technicians. It must be readily accessible to all staff members.

The laboratory's documentation must also contain the latest published versions of all the standards in the Test Group for which accreditation has been requested and also:

For the FIELD GROUP

ASTM C470 - Molds for Forming Concrete Test Cylinders Vertically

For the FIELD AND LABORATORY GROUP

ASTM C470 - Molds for Forming Concrete Test Cylinders Vertically

ASTM C511 - Moist Cabinets and Rooms Used in the Testing of Hydraulic
Cement and Concretes

ASTM C617 - Capping Cylindrical Concrete Specimens

ASTM E4 - Load Verification of Testing Machine

PERSONNEL

Technical Director:

The laboratory must have a Technical Director (Supervisor), who has appropriate technical background in the testing areas for which accreditation is desired.

Training:

A laboratory must ensure that each new staff member is trained for the testing duties assigned and that staff members are retrained when they are assigned new responsibilities or test methods are updated.

Each staff member must receive (or have had) training for assigned testing duties either through on-the-job training, formal classroom sessions or through technician certification programs such as those conducted by the American Concrete Institute (ACI) or the National Ready Mixed Concrete Association (NRMCA).

For the FIELD GROUP the training program must include as a minimum:

- the general requirements of each test method;
- field training in the performance of each test method; and
- techniques of shipping molded cylindrical concrete specimens from the field to a testing laboratory.

For the FIELD AND LABORATORY GROUP the training program must, include as a minimum:

- the general requirements of each test method;
- field and Laboratory training in the performance of each test method;
- techniques of shipping molded cylindrical concrete specimens from the field to a testing laboratory;
- techniques and procedures for using capping materials and apparatus;
- operation of the compression testing machine including procedures and techniques for the use and maintenance of the lower and upper bearing blocks, alignment of the cylindrical concrete specimens prior to testing, and rate of loading.

Forms which may be used for evaluating personnel after training may be obtained from NVLAP on request.

Competency:

In addition to training, the competency of each staff member must be evaluated by the laboratory through an observation of performance and an oral or written closed book examination for each test method the staff member is authorized to conduct. The performance observation must be conducted annually by the immediate supervisor or a designee appointed by the laboratory director. A record of the staff member's performance must be dated and signed by the supervisor and placed in the personnel file.

For those staff members who are certified by a recognized organization, the supervisor must still conduct an observation of performance at least annually and record the results.

Forms which may be used for the competency evaluations may be obtained from NVLAP on request.

EQUIPMENT AND FACILITIES

All equipment and facilities used for performing the tests in the Concrete LAP must conform with the requirements of the test methods. If, by virtue of some modification, the equipment is different from that called for by the test method, the laboratory must provide evidence (e.g., comparative test results, round robins, analytical or mathematical proof) that the use of the modified equipment does not result in test data deviations which are significantly different from data which could be obtained by the test equipment specified in the test method.

MAINTENANCE AND CALIBRATION

All test equipment inherently subject to change due to use or time, must be maintained and periodically calibrated. The equipment used for conducting the tests in the Concrete LAP must be maintained and calibrated (or verified) in accordance with the manufacturer's recommendation, as specified in the test method, or as specified in Table I, whichever frequency is greater.

Calibrations (or verifications) may be performed by the laboratory or by an external calibration service, but all calibrations must be traceable to the National Bureau of Standards (U.S. laboratories), to the appropriate national standards authority (non-U.S. laboratories), or to natural physical constants. Calibration certificates must be retained and made available for an assessor's inspection during the on-site visit. Traceability should be stated on the calibration certificate. If calibration is performed by the laboratory, metrology standards used and assurance of the maintenance of the required environmental conditions must be documented. Equipment for which traceability documentation will be required are indicated with an asterisk (*) in Table I.

TABLE I

<u>Apparatus</u>	<u>Calibration or Verification Frequency</u>
Compression testing machine(s) (see Note) *	12 months
Bearing blocks (see Note)	6 months
Temperature reading device(s) used in laboratory moist curing facility (see Note)*	12 months
Temperature reading device(s) used in field curing facility	12 months
Unit weight scale(s)*	12 months
Pressure air meter apparatus (C231)	6 months
Volumetric air apparatus (C173)	36 months
Molds (single use) (representative sample)	on receipt
Molds (reusable)	12 months
Slump cone(s)	12 months
Unit weight measure	12 months
Tamping rods	12 months
Capping apparatus including plates, capping material	6 months

RECORDKEEPING

A laboratory must maintain a functional recordkeeping system. This means that records must be easily accessible, in some logical order and contain complete information on the subject. Records covering the following items are required and will be reviewed during the on-site visit either in total or by selected sampling:

- Staff training dates and results;
- Staff competency review dates and results;
- Equipment calibration and maintenance;
- Test data and reports; and
- Sample tracking and logging.

Note: For FIELD AND LABORATORY GROUP only.

* Traceability documentation is required.

Equipment calibration (or verification) records should include the following:

- Equipment name or description;
- Model, style, or serial number;
- Manufacturer;
- Notation of all equipment variables requiring calibration or verification;
- The range of calibration/verification;
- The resolution of the instrument and its allowable error;
- Calibration/verification date and schedule;
- Date and result of last calibration;
- Identity of the laboratory individual or external service responsible for calibration; AND,
- Source of reference standard and traceability.

Forms which may be used to maintain calibration or verification records may be obtained from NVLAP on request.

Raw test data which a laboratory must maintain on report forms, technician notebooks, job tickets, etc., must include the following items for each set of companion cylinders:

- Concrete supplier;
- Concrete mix;
- Description of field curing facility;
- Field curing temperature;
- Field curing time;
- Method of moisture loss prevention;
- Ambient temperature and weather conditions on job site;
- Slump;
- Unit weight of concrete;
- Weight of unit weight bucket (tare);
- Concrete cylinder diameter measurements per ASTM C39;
- Air content;
- Name of person making cylinder;
- Name of person breaking cylinder;
- Breaking strength;
- Structure sample taken from; and
- Location in structure where sample was taken.

Sample tracking and logging records should trace the movement of specimens from time of casting at the jobsite to final compression testing. Dates, times, condition of sample and personnel involved should all be included.

TEST REPORT

The test report sent to the client for each specimen tested must contain at least the following:

- Identification number;
- Diameter;
- Cross sectional area;
- Maximum load;
- Compressive strength;
- Type of fracture;
- Defects;
- Age; and
- Any deviations from the standard method of test.

TEST METHOD PERFORMANCE

A laboratory is accredited in the Concrete LAP to perform tests in "strict conformance" with the latest version of the method as written. If a laboratory knowingly deviates from a method during the performance of a test it must indicate the deviation on the final test report.

For example, the procedures in ASTM C31 require that during initial field curing, concrete cylinders must be:

- Maintained at a curing temperature between 60-80°F;
- Prevented from losing moisture;
- Provided with security against physical damage; and
- Transferred to a moist curing facility after 20-24 hours.

If the laboratory fails to perform any one or all of these functions, that fact must be entered on the final report.

V. PROFICIENCY TESTING REQUIREMENTS

The proficiency testing requirement for the Concrete LAP consists of a required within-laboratory program. The within-laboratory program must be implemented by a laboratory within 90 days after application for accreditation.

An optional between-laboratory program is also offered to those laboratories desiring a higher level of quality assurance. Both programs are intended to provide a laboratory with a means of checking the reliability of its test results.

Both proficiency programs provide statistical methods for a laboratory to monitor the results of compression tests of cylindrical concrete specimens (cylinders). The test results used in the computations for each program must be from cylinders made by the personnel of the laboratory (not contractor's cylinders) during its regular business operations. In the case of a laboratory enrolled in the FIELD AND LABORATORY GROUP, the cylinders must be compression tested by personnel of that same laboratory. A laboratory enrolled in the FIELD GROUP is responsible for obtaining the test results from the compression testing facility that it contracts with.

Both proficiency programs require a laboratory to submit periodic reports based on the analysis specified in the following sections. Failure to submit the within-laboratory reports may result in loss of accreditation.

In the following section the term "set of companion cylinders" refers to a set of two or three cylinders made from a single sample of field concrete.

WITHIN-LABORATORY PROGRAM (REQUIRED)

This program provides a method to monitor the average variation in sets of companion cylinders made by laboratory personnel. The method uses data from individual sets of companion cylinders and specifies a statistical analysis to indicate one-week and five-week patterns in the within-laboratory variation.

This procedure can indicate problems as they occur over a period of time. It is not intended to catch isolated mistakes, but to reveal long-term effects such as out of calibration equipment or a technician who may be consistently performing the tests improperly.

By interpreting the results of the analysis (as described on page 21) a laboratory will be able to determine when problems occur. It must then take action to remedy them. The report of those results and any corrective action must be submitted to NVLAP twice each year.

DATA SELECTION

The test data selected should be from the laboratory's routine work. The concrete should have a nominal specified compressive strength between 3000 and 5000 psi and a slump exceeding two inches. The cylinders should be 6 x 12 inches and cured for 28 days. If the specimens selected are not within these limits, please note any deviations on Table II.

To perform the analyses which follow, a laboratory should use data from all the applicable tests which the laboratory performs or, if there is a very large work load, a random selection of not less than 10 tests per week. The selected test data must be recorded for submission to NVLAP. Table II shows the required information giving a suggested format which may be reproduced and used.

DATA ANALYSIS METHOD

1. For each individual set of companion cylinders calculate:

\bar{X}_i the average strength of the set in psi
and
 R_i the difference (range) between the highest and lowest strength value

EXAMPLE: if cylinder #1 = 3750 psi
cylinder #2 = 3970 psi

to determine \bar{X}_i

$$\begin{array}{r} \text{add } 3750 \\ + 3970 \\ \hline 7720 \end{array} \qquad \text{then divide } \frac{3860}{2} / 7720$$

resulting in $\bar{X}_i = 3860$ psi

to determine R_i

$$\begin{array}{r} \text{subtract } 3970 \\ - 3750 \\ \hline 220 \end{array}$$

resulting in $R_i = 220$ psi

2. Calculate the individual set coefficient of variation V_i (expressed as a percentage) for each set by using \bar{X}_i and R_i :

$$V_i = \frac{R_i \cdot d}{\bar{X}_i} \cdot 100$$

where for a set of 2 cylinders $d = 0.886^*$
for a set of 3 cylinders $d = 0.591$

EXAMPLE: using numbers calculated above

$$V_i = \frac{(220) \cdot (0.886)}{3860} \cdot 100$$

resulting in $V_i = 5.14\%$

* Derived from table B2 ASTM STP 15-C

3. Calculate the average coefficient of variation \bar{V} of all the sets selected for the week:

$$\bar{V} = \frac{\sum_{i=1}^n V_i}{n}$$

where: n = number of sets selected for the week

EXAMPLE: for six (6) sets of V_i with values
5.14, 4.27, 3.35, 2.57, 3.98, 2.75

add 5.14	then divide	$\frac{3.68}{6}$
4.27		$\frac{22.06}{6}$
3.35		
2.57		
3.98		
<u>+ 2.75</u>		
22.06		

resulting in $\bar{V} = 3.68\%$ for this week

4. Calculate the moving average coefficient of variation \bar{V} of the weekly averages for the five most recent weeks for which tests were performed:

$$\bar{V} = \frac{\sum_{i=1}^5 \bar{V}_i}{5}$$

Note: When calculating \bar{V} , do not include weeks for which no tests were performed, i.e., do not average zero's into the 5 week running average.

EXAMPLE: for five (5) weeks with averages of
3.68, 4.97, 8.60, 2.90, 5.33

add 3.68	then divide	$\frac{5.09}{5}$
4.97		$\frac{25.48}{5}$
8.60		
2.90		
<u>+ 5.33</u>		
25.48		

resulting in $\bar{V} = 5.09\%$

5. Rate the five week moving average coefficient of variation \bar{V} as follows:

\bar{V}	<u>Rating</u>
below 5.0%	satisfactory (SAT)
above 5.0%	unsatisfactory (UNSAT)

TABULATION

Formal tables must be maintained to provide a running check on testing operations. Required forms (see Note) are shown by Tables II and III. Table II is a daily record of tests for monitoring individual set within-test variation. Table III is a weekly and five (5) week record of average within test coefficients of variation. An example of Table III is shown below.

<u>Week Ending</u>	<u>Approximate Number of Tests for Week</u>	<u>No. of Tests Sampled for Week</u>	<u>No. of V_j Exceeding 10%</u>	<u>Weekly Avg. \bar{V}(%)</u>	<u>5 Week =Avg. \bar{V}(%)</u>	<u>Rating</u>
3/3	85	10	0	3.68		
3/10	110	10	0	4.97		
3/17	100	10	2	8.60		
3/24	125	10	1	2.90		
3/31	115	10	0	5.33	5.10	UNSAT
4/7	90	10	1	7.00	5.76	UNSAT
4/14	140	10	3	11.00	6.97	UNSAT
4/21	130	10	1	4.20	6.09	UNSAT
4/28	145	10	1	4.50	6.41	UNSAT
5/5	120	10	0	3.05	5.95	UNSAT
5/12	140	10	0	2.00	4.95	SAT
5/19	160	10	0	4.00	3.55	SAT
5/26	180	10	0	3.70	3.45	SAT
6/2	170	10	0	4.31	3.41	SAT

Note: If tables are generated by ADP equipment, please use a format as close as possible to the one shown.

INTERPRETATION

The limits for the values obtained in the analysis are:

V_j - should not exceed 10% more than one time out of 20 sets selected

=

\bar{V} - should not exceed 5% for any period

If either of the above limits are exceeded the laboratory must investigate and take appropriate action to locate and correct the problem. Documentation detailing the investigation and corrective action must be maintained by the laboratory and a summary must be submitted to NVLAP along with the report containing both their daily and weekly records as indicated in Tables II and III.

[The text in this section is extremely faint and illegible. It appears to be a list or a series of entries, possibly containing names and dates, but the specific details cannot be discerned.]





SUMMARY OF REQUIREMENTS FOR WITHIN-LABORATORY PROGRAM

In order to remain accredited, a laboratory must:

1. Implement a within-laboratory proficiency program within 90 days after the date of application for accreditation;
2. Document the corrective actions used to respond to problem areas identified by out of tolerance results on the within-test variation table;
3. Submit to NBS copies of the within-test variation tables developed, as shown in Tables II and III, two times each year, due January 1 and July 1.
A summary of any corrective actions taken in response to out of tolerance results must be included with the table.

Submit tables to:

National Voluntary Laboratory Accreditation Program
Concrete LAP Proficiency Data
National Bureau of Standards
ADMIN A531
Gaithersburg, MD 20899

For assistance call (301) 921-3431

Failure to meet these requirements may be grounds for adverse accreditation action.

BETWEEN-LABORATORY PROGRAM (OPTIONAL)

This program provides a method by which an accredited laboratory can compare the results of compression tests it performs with those of one or more other laboratories. To carry out this program, an accredited laboratory must locate at least one other laboratory which is willing to cooperate in the production of sets of companion cylinders (See general comments on page 19).

COOPERATING LABORATORY

Each participating laboratory must arrange with a cooperating laboratory a mutually agreeable jobsite where a technician(s) from each laboratory can obtain a sample of the same concrete and upon which each can independently perform field tests and make a set of companion cylinders.

An accredited laboratory must select its cooperating laboratory(ies) using the following qualifications:

1. The other laboratory is NVLAP accredited. (ideal situation)
2. A non-accredited laboratory must be one of the following:
 - Commercial testing laboratory;
 - Laboratory administered by a State, municipality, or other governmental agency; or
 - Laboratory operated by a representative of a contractor, engineer, architect, concrete producer, or other agency on a job.

In unusual circumstances, if no other qualified laboratory is available in a convenient geographical area, contact NVLAP to consider other possible arrangements.

There is no mandatory period of time over which the cooperating laboratory should continue to work with the accredited laboratory. However, a minimum period of one year is recommended.

SAMPLING AND TESTING REQUIREMENTS

The sampled concrete should be part of either laboratory's routine work. It is suggested that the laboratories alternate visits to one another's project sites to share the expense of the trips. To promote uniformity in the analysis of data returned to NVLAP, each laboratory should prepare two companion cylinders from concrete having a nominal specified compressive strength between 3000-5000 psi and a slump exceeding 2 inches. The cylinders should be 6 x 12 inches and cured for 28 days. If the specimens used are not within the limits, please note on Table IV.

For participants in the FIELD AND LABORATORY GROUP, after initial curing, each set of companion cylinders should be taken back to the respective laboratory, moist cured for the same time, (preferably 28 days) and then broken according to ASTM C39. The laboratories should then exchange data and each perform the data analysis.

For participants in the FIELD GROUP, after initial curing, the cylinders must be delivered to a suitable laboratory for moist curing and compression testing. After testing it is the responsibility of the participating laboratory to obtain the test results, exchange them with the cooperating laboratory and then each should perform the data analysis.

It is recommended that the same cooperating laboratory be used for at least 10 tests done on a regular basis. The analysis (Table IV parts A and B) should be continuous for as long as the same cooperating laboratory is used. As long as there is no change in the cooperating laboratory nor a major change in concrete class, the analysis should be continued from season to season. If more than one cooperating laboratory is used in a season, a different table should be created for each. If the classes of concrete that are used are sufficiently different to affect performance each class should be analysed separately.

DATA ANALYSIS METHOD

The following method is to be used for comparing data from two laboratories. If comparisons are made among more than two laboratories, the analysis is to be performed between pairs of laboratories. The calculations should be performed independently by each laboratory, and submitted to NVLAP independently, if both (all) laboratories are NVLAP participants.

Your laboratory (Lab A)

1. Calculate the average strength \bar{X}_A for the set of companion cylinders made by your laboratory.

EXAMPLE: if cylinder #1 = 3750 psi
 cylinder #2 = 3970 psi

$$\begin{array}{r} \text{add } 3750 \\ + 3970 \\ \hline 7720 \end{array} \qquad \begin{array}{l} \text{then divide} \\ 2 \ / \ 7720 \end{array}$$

resulting in $\bar{X}_A = 3860$ psi

Cooperating Laboratory (Lab B)

2. Calculate the average strength \bar{X}_B for the set of companion cylinders made by the cooperating laboratory.

EXAMPLE: if cylinder #1 = 3870 psi
 cylinder #2 = 3760 psi

$$\begin{array}{r} \text{add } 3870 \\ + 3760 \\ \hline 7630 \end{array} \qquad \begin{array}{l} \text{then divide} \\ 2 \ / \ 7630 \end{array}$$

resulting in $\bar{X}_B = 3815$ psi

3. Calculate the individual difference D_i between your laboratory and the cooperating laboratory:

$$D_i = \bar{X}_A - \bar{X}_B$$

Note: always identify each laboratory with the same letter to maintain the polarity, since D_i could be either positive or negative.

EXAMPLE 1: using numbers calculated above

$$\begin{array}{r} \text{subtract} \quad 3860 \\ \quad \quad \quad - 3815 \\ \hline \quad \quad \quad 45 \end{array}$$

resulting in $D_i = 45$ psi

EXAMPLE 2: if $\bar{X}_A = 3770$
and $\bar{X}_B = 3900$

$$\begin{array}{r} \text{subtract} \quad 3770 \\ \quad \quad \quad - 3900 \\ \hline \quad \quad \quad -130 \end{array}$$

resulting in $D_i = -130$ psi

4. Calculate the average difference of the current and previous five (5) comparisons (or the total number of comparisons if less than six (6) but do not use less than three) using the equation:

$$\bar{D} = \frac{\sum D_i}{n}$$

where $\sum D_i$ = algebraic sum of the individual differences observing the sign of each difference

n = number of comparisons (between 3 and 6)

EXAMPLE: for six (6) comparisons of
183, 237, 146, 107, 312, 230

$$\begin{array}{r} \text{add} \quad 183 \\ \quad \quad 237 \\ \quad \quad 146 \\ \quad \quad 107 \\ \quad \quad 312 \\ \quad \quad + 230 \\ \hline \quad \quad 1215 \end{array} \qquad \text{then divide} \quad \begin{array}{r} 202.5 \\ 6 \ / \ 1215.0 \end{array}$$

resulting in $\bar{D} = 203$ psi

5. Calculate the standard deviation s of n comparisons:

$$s = \sqrt{\frac{\sum(D_i)^2 - \frac{(\sum D_i)^2}{n}}{n - 1}}$$

where $\sum(D_i)^2$ = algebraic sum of squared individual differences

$(\sum D_i)^2$ = square of the algebraic sum of individual differences

EXAMPLE: for six (6) comparisons of D_i of
183, 237, 146, 107, 312, 230

1. add $D_1 = 183$
 $D_2 = 237$
 $D_3 = 146$
 $D_4 = 107$
 $D_5 = 312$
 $D_6 = \underline{230}$

add $(D_1)^2 = 33489$
 $(D_2)^2 = 56169$
 $(D_3)^2 = 21316$
 $(D_4)^2 = 11449$
 $(D_5)^2 = 97344$
 $(D_6)^2 = \underline{52900}$

$\sum D_i = 1215$

$\sum(D_i)^2 = 272667$

$(\sum D_i)^2 = 1476225$

2. divide $(\sum D_i)^2$ by n

$\frac{246037.5}{6 / 1476225.0}$

3. subtract $\frac{272667.0}{- 246037.5}$
 $\underline{\hspace{1.5cm}} 26629.5$

4. divide by $n-1$

$\frac{5325.9}{5 / 26629.5}$

5. take

$\sqrt{5325.9} = 72.98$

6. resulting in $s = 73$ (after rounding off)

6. Using the standard deviation s calculate the significant difference (sig. diff.) of n comparisons using the equation:

$$\text{sig. diff.} = \frac{ts}{\sqrt{n}}$$

where for:

n	t	\sqrt{n}
3	9.92	1.73
4	5.87	2.00
5	4.60	2.24
6	4.03	2.45

EXAMPLE: for the same six (6) comparisons used above where $s = 73$ and from table: $t = 4.03$ and $\sqrt{n} = 2.45$

$$\text{sig. diff.} = \frac{(4.03)(73)}{2.45} = \frac{294.20}{2.45} = 120$$

7. The information required for filling in the "Action Required" column in Table IV part A is contained in the Interpretation section which follows.

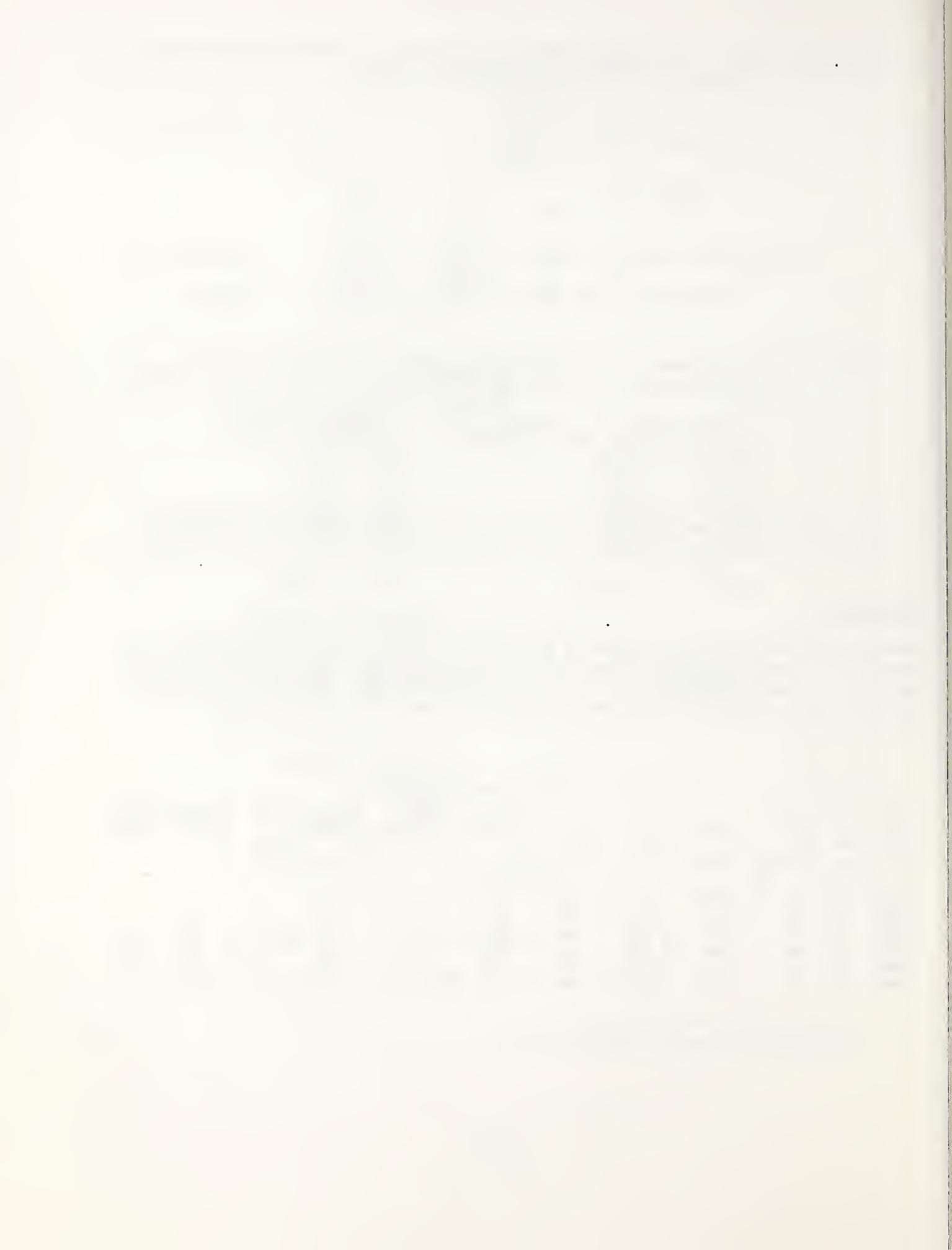
TABULATION

Formal tables must be maintained to provide a running check on the test results. A sample table is shown in the example below. The forms which should be used to report the between-laboratory comparison test results are shown in Table IV parts A and B. An example of Table IV part A is shown below.

TABLE IV part A

DATE SAMPLED AND CAST	AGE AT TEST, DAYS	SAMPLE NUMBER OR DESCRIPTION	CLASS OF CONCRETE	LAB A, \bar{x}_A	LAB B, \bar{x}_B	INDIVIDUAL DIFFERENCE, D_1	AVERAGE DIFFERENCE, \bar{D}	STANDARD DEVIATION, s	NUMBER OF TESTS, n	SIGNIFICANT DIFFERENCE	ACTION REQUIRED
820823	28	A92	3000	3498	3315	183			1		
820825	28	A93	3000	3427	3190	237			2		
820829	28	B32	3500	3826	3680	146	189	46	3	262	
820907	28	B39	2500	3127	3020	107	168	55	4	162	
820913	28	B46	3000	3467	3155	312	197	80	5	165	yes*
820927	28	C21	2500	2880	2650	230	203	73	6	120	yes*
821004	28	C30	3500	3578	3588	-10	170	114	6	188	

* 5 or more consecutive D_1 have the same sign and the absolute value of \bar{D} exceeds the significant difference





INTERPRETATION

The results of the between-laboratory comparison tests should be interpreted as follows.

1. Compare the average difference \bar{D} and the significant difference "sig. diff." for each period.

Conclude that:

Your laboratory and the cooperating laboratory are probably obtaining significantly different results if the absolute value of \bar{D} exceeds sig. diff.

2. Examine the sign of consecutive individual differences " D_i "

Conclude that:

(a) It is likely that your laboratory and the cooperating laboratory are obtaining different results if five (5) consecutive individual differences D_i have the same sign.

(b) It is certain that your laboratory and the cooperating laboratory are obtaining different results if seven (7) consecutive individual differences D_i have the same sign.

3. Check for gross errors. Examine the individual difference " D_i " in a group of seven (7) consecutive comparisons (D_1, D_2, \dots, D_7). If any one of the " D_i " values appears to be in gross error, i.e., very high or very low in comparison with the other six, use the following method to check for a gross error.

Using the other six " D_i " values (not including the " D_i " under investigation), calculate the average \bar{D}_{ec} (ec = error check) and the standard deviation "s" for the six values using the equations given in steps (4) and (5) of the data analysis method.

Conclude that:

If the D_i under investigation differs from the \bar{D}_{ec} by more than $3s$ then a gross error has occurred.

When significant differences or gross errors are concluded in steps (1), (2), or (3) a review of your laboratory and the cooperating laboratory's test operations should be thoroughly reviewed to identify the cause. After corrective action has been taken an additional between-laboratory comparison should be performed to verify that the problem(s) has been eliminated.

Note: This procedure may pose a problem in the case where the cooperating laboratory is not an accredited laboratory. They may not wish to cooperate to the extent of locating the cause for any differences. However, the accredited laboratory must review its own operation and take action to the extent that it can.

SUMMARY OF REQUIREMENTS FOR BETWEEN-LABORATORY PROGRAM

THIS PROGRAM IS NOT REQUIRED. Participation is on a voluntary basis. NVLAP will provide analysis of all data submitted and periodic reports of results to participants.

Each participating laboratory shall:

1. be responsible for obtaining the cooperating laboratory(ies);
2. should arrange a comparison test on an average of every six (6) weeks of the their annual operating season, with the maximum period between comparison tests not to exceed ten (10) weeks; and
3. in order to be included in the analysis done by NVLAP, submit to NBS a copy of the between-laboratory comparison test results table, as shown in Table IV parts A and B, by January 1 and/or July 1 each year.

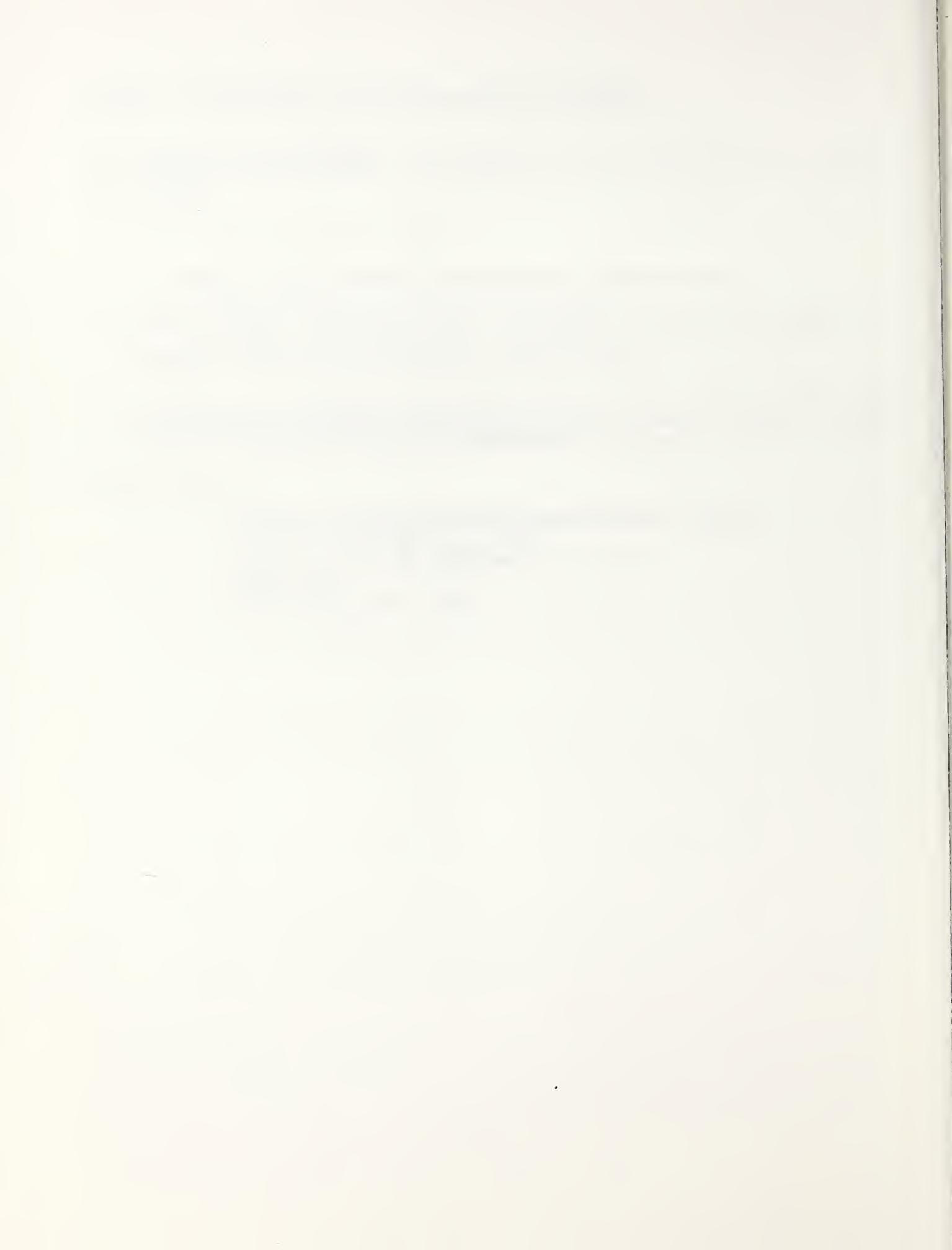
Submit tables to:

National Voluntary Laboratory Accreditation Program
Concrete LAP Proficiency Data
National Bureau of Standards
ADMIN A531
Gaithersburg, MD 20899

APPENDICES

NVLAP Accreditation Criteria

NVLAP Lab Bulletin No. 3A



NVLAP Accreditation Criteria

SUBPART D - CONDITIONS AND CRITERIA FOR ACCREDITATION

Sec. 7.31 Application of accreditation conditions and criteria.

(a) To become accredited and maintain accreditation, a laboratory must meet the conditions for accreditation set out in Section 7.32 and the criteria set out in Section 7.33 as tailored for specific LAPs.

(b) The conditions leading to accreditation include acceptance of the responsibilities of an accredited laboratory and requirements for information disclosure.

(c) The criteria are tailored and interpreted for the test methods, types of test methods, products, services or standards of the relevant LAP. These tailored criteria are the technical requirements for accreditation developed through the procedures of Section 7.15.

(d) In applying the conditions, criteria, and technical requirements for accreditation, the Director of OPSP shall not:

- (1) Prohibit accreditation solely on the basis of a laboratory's affiliation or nonaffiliation with manufacturing, distributing, or vending organizations, or because the laboratory is a foreign firm; or
- (2) Develop, modify, or promulgate test methods, standards, or comparable administrative rules.

Sec. 7.32 Conditions for accreditation.

(a) To become accredited and maintain accreditation, a laboratory shall agree in writing to:

- (1) Be assessed and evaluated initially and on a periodic basis;
- (2) Demonstrate, on request, that it is able to perform the tests representative of those for which it is seeking accreditation;
- (3) Pay all relevant fees;
- (4) Participate in proficiency testing as required.
- (5) Be capable of performing the tests for which it is accredited according to the latest version of the test method within one year after its publication or within another time limit specified by the Director of OPSP;
- (6) Limit the representation of the scope of its accreditation to only those tests or services for which accreditation is granted;
- (7) Limit all its test work or services for clients to those areas where competence and capacity are available;
- (8) Limit advertising of its accredited status to letterheads, brochures, test reports, and professional, technical, trade, or other laboratory services publications, and use the NVLAP logo under guidance provided by the Director of OPSP;
- (9) Inform its clients that the laboratory's accreditation or any of its test reports in no way constitutes or implies product certification, approval, or endorsement by NBS;
- (10) Maintain records of all actions taken in response to testing complaints for a minimum of one year;

- (11) Maintain an independent decisional relationship between itself and its clients, affiliates, or other organizations so that the laboratory's capacity to render test reports objectively and without bias is not adversely affected;
 - (12) Report to the Director of OPSP within 30 days any major changes involving the location, ownership, management structure, authorized representative, approved signatories, or facilities of the laboratory; and
 - (13) Return to the Director of OPSP the certificate of accreditation for possible revision or other action should it:
 - (i) be requested to do so by the Director of OPSP;
 - (ii) voluntarily terminate its accredited status; or
 - (iii) become unable to conform to any of these conditions or the applicable criteria of Section 7.33 and related technical requirements.
- (b) To become accredited and maintain accreditation, a laboratory shall supply, upon request, the following information:
- (1) Legal name and full address;
 - (2) Ownership of the laboratory;
 - (3) Organization chart defining relationships that are relevant to performing testing covered in the accreditation request;
 - (4) General description of the laboratory, including its facilities and scope of operation;
 - (5) Name and telephone number of the authorized representative of the laboratory;
 - (6) Names or titles and qualifications of laboratory staff nominated to serve as approved signatories of test reports that reference NVLAP accreditation; and
 - (7) Other information as may be needed for the specific LAP(s) in which accreditation is sought.

Sec. 7.33 Criteria for accreditation.

- (a) Quality System. (1) The laboratory shall operate under an internal quality assurance program appropriate to the type, range, and volume of work performed. The quality assurance program must be designed to ensure the required degree of accuracy and precision of the laboratory's work and should include key elements of document control, sample control, data validation, and corrective action. The quality assurance program must be documented in a quality manual or equivalent (e.g., operations notebook) which is available for use by laboratory staff. A person(s) must be identified as having responsibility for maintaining the quality manual.
- (2) The quality manual must include as appropriate:
 - (i) The laboratory's quality assurance policies including procedures for corrective action for detected test discrepancies;
 - (ii) Quality assurance responsibilities for each function of the laboratory;
 - (iii) Specific quality assurance practices and procedures for each test, type of test, or other specifically delineated function performed;
 - (iv) Specific procedures for retesting, control charts, reference materials, and interlaboratory tests; and
 - (v) Procedures for dealing with testing complaints.
- (3) The laboratory shall periodically review its quality assurance system by or on behalf of management to ensure it's continued effectiveness. These reviews must be recorded with details of any corrective action taken.

- (b) Staff. (1) The laboratory shall:
- (i) Be staffed by individuals having the necessary education, training, technical knowledge, and experience for their assigned functions; and
 - (ii) Have a job description for each professional, scientific, supervisory and technical position, including the necessary education, training, technical knowledge, and experience.
- (2) The laboratory shall document the test methods each staff member has been assigned to perform.
- (3) The laboratory shall have a description of its training program for ensuring that new or untrained staff are able to perform tests properly and uniformly to the requisite degree of precision and accuracy.
- (4) The laboratory shall be organized:
- (i) So that staff members are not subjected to undue pressure or inducement that might influence their judgment or results of their work; and
 - (ii) In such a way that staff members are aware of both the extent and the limitation of their area of responsibility.
- (5) The laboratory shall have a technical manager (or similar title) who has overall responsibility for the technical operations of the laboratory.
- (6) The laboratory shall have one or more signatories approved by the Director of OPSP to sign test reports that reference NVLAP accreditation. Approved signatories shall:
- (i) Be competent to make a critical evaluation of test results; and
 - (ii) Occupy positions within the laboratory's organization which makes them responsible for the adequacy of test results.
- (c) Facilities and Equipment. (1) The laboratory shall be furnished with all items of equipment and facilities for the correct performance of the tests and measurements for which accreditation is granted and shall have adequate space, lighting, and environmental control, and monitoring to ensure compliance with prescribed testing conditions.
- (2) All equipment must be properly maintained to ensure protection from corrosion and other causes of deterioration. Instructions for a proper maintenance procedure for those items of equipment which require periodic maintenance must be available. Any item of equipment or component thereof which has been subjected to overloading or mishandling, gives suspect results, or has been shown by calibration or otherwise to be defective, must be taken out of service and clearly labelled until it has been repaired. When placed back in service, this equipment must be shown by test or calibration to be performing its function satisfactorily.
- (3) Records of each major item of equipment must be maintained. Each record must include:
- (i) The name of the item of equipment;
 - (ii) The manufacturer's name and type, identification and serial number;
 - (iii) Date received and date placed in service;
 - (iv) Current location, where appropriate;
 - (v) Details of maintenance; and
 - (vi) Date of last calibration, next calibration due date, and calibration report references.

(d) Calibration. The laboratory shall:

- (1) Calibrate new testing equipment before putting it into service;
- (2) Recalibrate, at regular intervals, in-service testing equipment with the calibration status readily available to the operator;
- (3) Perform checks of in-service testing equipment between the regular calibration intervals, where relevant;
- (4) Maintain adequate records of all calibrations and recalibrations; and
- (5) Provide traceability of all calibrations and reference standards of measurement where these standards exist. Where traceability of measurements to primary (national or international) standards is not applicable, the laboratory shall provide satisfactory evidence of the accuracy or reliability of test results (e.g., by participation in a suitable program of interlaboratory comparison).

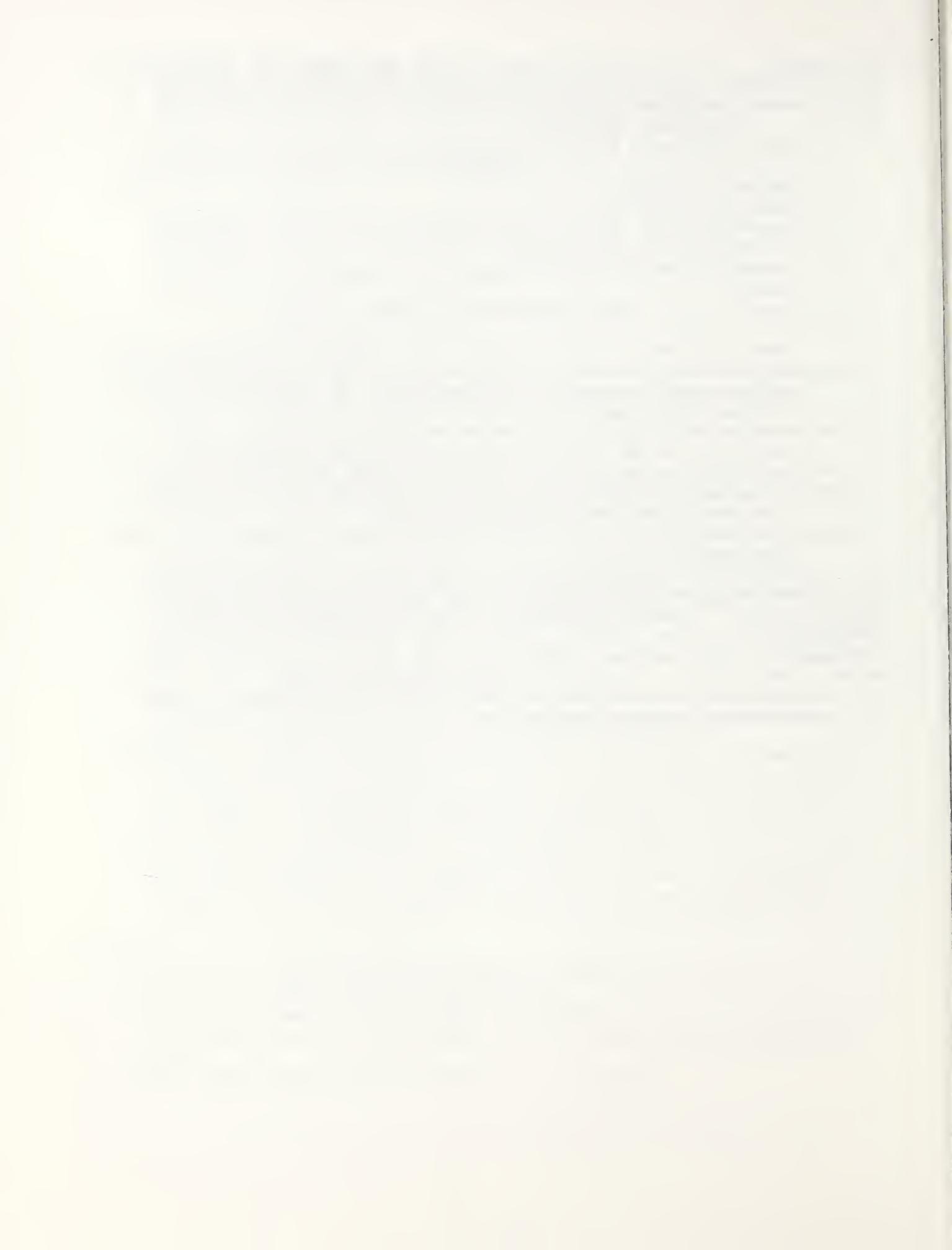
(e) Test Methods and Procedures. The laboratory shall:

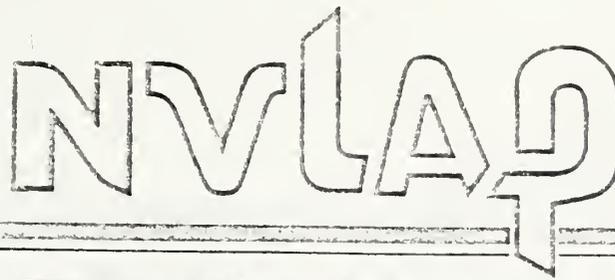
- (1) Conform in all respects with the test methods and procedures required by the specifications against which the test item is to be tested, except that whenever a departure becomes necessary for technical reasons the departure must be acceptable to the client and recorded in the test report;
- (2) Have data to prove that any departures from standard methods and/or procedures due to apparatus design or for other reasons do not detract from the expected or required precision of the measurement;
- (3) Maintain a test plan for implementing testing standards and procedures including adequate instructions on the use and operation of all relevant equipment, on the handling and preparation of test items (where applicable), and on standard testing techniques where the absence of such instructions could compromise the test. All instructions, testing standards, specifications, manuals, and reference data relevant to the work of the laboratory must be kept up-to-date and made readily available to the staff;
- (4) Maintain measures for the detection and resolution of in-process testing discrepancies for manual and automatic test equipment and electronic data processing equipment, where applicable;
- (5) Maintain a system for identifying samples or items to be tested, which remains in force from the date of receipt of the item to the date of its disposal, either through documents or through marking to ensure that there is no confusion regarding the identity of the samples or test items and the results of the measurements made; and
- (6) Maintain rules for the receipt, retention, and disposal of test items, including procedures for storage and handling precautions to prevent damage to test items which could invalidate the test results. Any relevant instructions provided with the tested item must be observed.

(f) Records. The laboratory shall:

- (1) Maintain a record system which contains sufficient information to permit verification of any issued report;
- (2) Retain all original observations, calculations and derived data, and calibration records for one year unless a longer period is specified; and
- (3) Hold records secure and in confidence, as required.

- (g) Test Reports. (1) The laboratory shall issue test reports of its work which accurately, clearly, and unambiguously present the specified test results and all required information. Each test report must include the following information as applicable:
- (i) Name and address of the laboratory;
 - (ii) Identification of the test report by serial number, date, or other appropriate means;
 - (iii) Name and address of client;
 - (iv) Description and identification of the test specimen, sample, or lot of material represented;
 - (v) Identification of the test specification, method, or procedure used;
 - (vi) Description of sampling procedure, if appropriate;
 - (vii) Any deviations, additions to, or exclusions from the test specifications;
 - (viii) Measurements, examinations, and derived results supported by tables, graphs, sketches, and photographs, as appropriate, and any failures identified;
 - (ix) A statement of measurement uncertainty where relevant;
 - (x) Identification of the organization and the person accepting technical responsibility for the test report and date of issue;
 - (xi) A statement that the report must not be reproduced except in full with the approval of the laboratory; and
 - (xii) A statement to the effect that the test report relates only to the items tested.
- (2) The laboratory shall issue corrections or additions to a test report only by a further document suitably marked, e.g. "Supplement to test report serial number", which meets the relevant requirements of Section 7.33(g)(1).
- (3) The laboratory shall retain a copy of each test report issued for one year unless a longer period is specified by the Director of OPSP.
- (4) The laboratory shall ensure that all test reports endorsed with the NVLAP logo are signed by an approved signatory.





Bulletin

Lab Bulletin No. 3A

January 1, 1985

INFORMING THE PUBLIC OF YOUR ACCREDITATION STATUS

Summary

This Bulletin supersedes NVLAP Lab Bulletin No. 3 dated October 1, 1981. It reflects significant changes made to the NVLAP procedures (Title 15, Part 7, of the Code of Federal Regulations) which became effective on December 10, 1984.

The Bulletin is addressed primarily to personnel at accredited laboratories who are responsible for communicating the laboratory's accreditation status to clients and the public, through advertising, issuance of test reports, use of the NVLAP logo, etc.

The Bulletin's purpose is to "provide guidance on referencing the laboratory's accredited status, and use of the NVLAP logo by the laboratory and its clients," in accordance with provisions of the NVLAP Procedures.

Background

NVLAP was established to assist industry and government in identifying competent testing laboratories. NVLAP accreditation means that a laboratory is competent to perform specific test methods in selected fields of testing. The NVLAP Procedures are the bases upon which the entire program operates and accomplishes accreditation of laboratories. Parts A and B of the Procedures provide general information and the method by which a new Laboratory Accreditation Program (LAP), in a new field of testing, may be requested and established. Parts C and D of the Procedures, of more concern to accredited laboratories, describe how a laboratory becomes accredited and the conditions and criteria for initial and continued accreditation. This Bulletin is concerned principally with issues in Part D of the Procedures.

Requirements and Guidance

To become accredited and maintain accreditation a laboratory shall:

limit the representation of the scope of its accreditation to only those tests or services for which accreditation is granted

A laboratory accredited by NVLAP may use the following statement on its letterheads and in trade or other publications: "Accredited by the National Bureau of Standards, National Voluntary Laboratory Accreditation Program for selected test methods for --(identify product or service area(s))." This statement could, for example, be placed at the bottom of the laboratory letterhead.

A laboratory's letterhead containing a reference to its NVLAP accreditation may be used in any direct solicitation for business from potential customers. It is recommended that a copy of the NVLAP Certificate and Scope of Accreditation be appended to such a solicitation.

To become accredited and maintain accreditation a laboratory shall:

limit advertising of its accredited status to letterheads, brochures, test reports, and professional, technical, trade, or other laboratory services publications, and use the NVLAP logo under guidance provided by NBS

A statement about NVLAP accreditation and the NVLAP logo may be used on reports and data sheets containing test data obtained by a laboratory provided the tests or services are performed in accordance with the terms of its accreditation. The NVLAP logo may not be used on test reports or data sheets during any period of suspended or expired accreditation or after voluntary or involuntary termination of accreditation.

The nature or type of product advertising prohibited by NVLAP procedures includes any advertising that is intended to encourage a consumer to purchase a product because it was tested by an accredited laboratory, whether that advertising appears in consumer media, the business media, or at a point of sale to consumers.

News stories and advertising by laboratories of their accredited status in the trade press is not only permissible but encouraged. The use of advertisements in the trade press is consistent with NVLAP procedures.

The "consumer media" to be avoided include popular periodicals such as Time, Good Housekeeping, etc., and newspapers such as the Washington Post or the New York Times. The term "consumer media" does not include business publications such as Barron's, or the Wall Street Journal which are oriented to the business community and in which products per se normally are not advertised.

To become accredited and maintain accreditation a laboratory shall:

inform its clients that the laboratory's accreditation or any of its test reports in no way constitutes or implies product certification, approval, or endorsement by NBS

Laboratory accreditation by NBS confers recognition that a laboratory has been found competent to perform specific test methods or services in a selected field(s) of testing. Laboratories must avoid all inference that accreditation under NVLAP carries with it an endorsement, approval, or recommendation of the products tested by the laboratories.

To become accredited and maintain accreditation a laboratory shall:

assure that all test reports endorsed with the NVLAP logo are signed by an approved signatory

An approved signatory is an officer or employee of the laboratory, identified by name or position, who has been accepted by NVLAP as being responsible for the issuance of test reports under this condition of NVLAP accreditation. A laboratory seeking initial accreditation or reaccreditation must specify (a) one or more individuals, or (b) position(s) within the organization for which it requests acceptance as an approved signatory.

Computer or machine generated test reports that contain the NVLAP logo need not be signed but must have the printed name of the approved signatory.

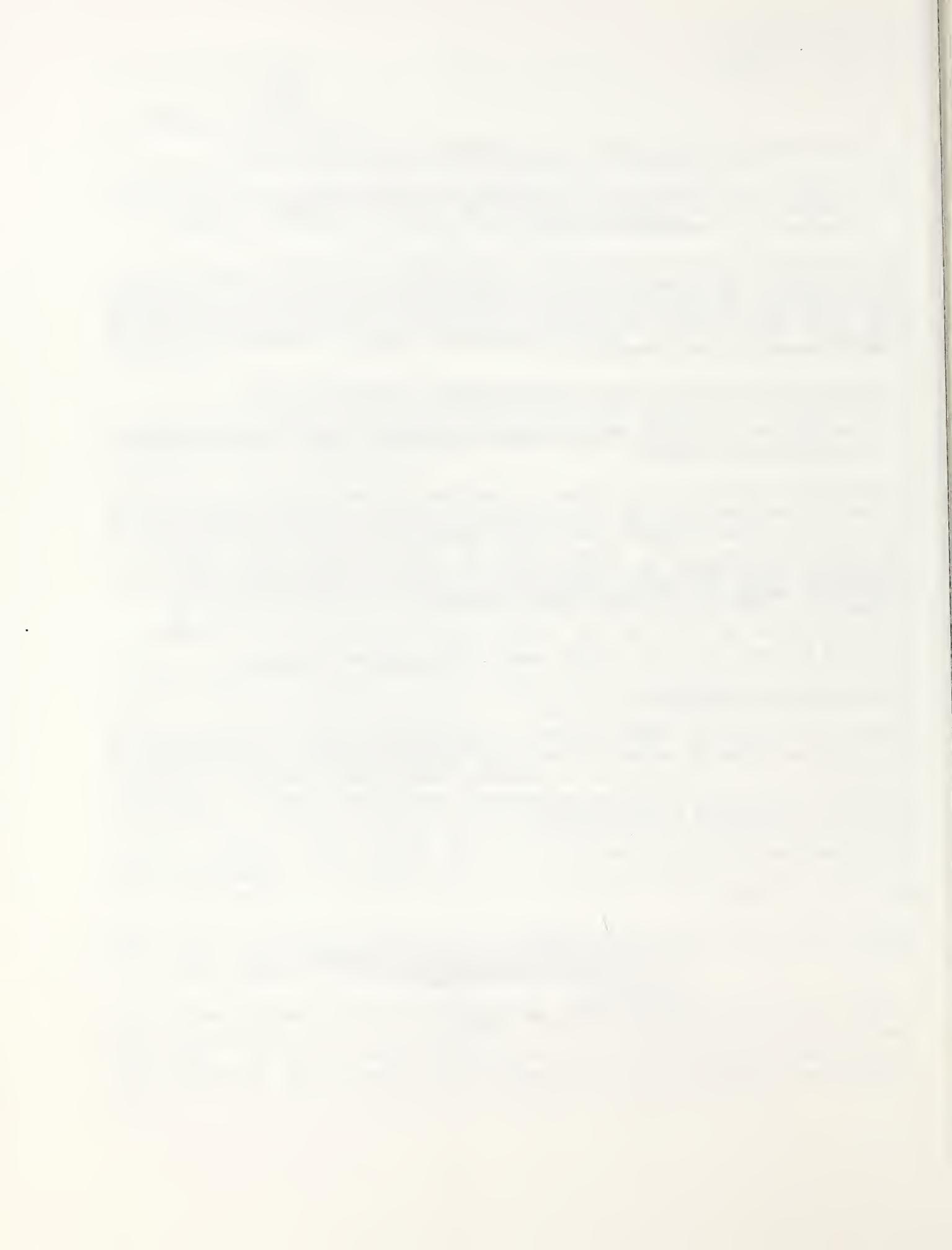
Questions About Accreditation

If you have questions about what is an acceptable method of advertising in areas not specifically covered in this Lab Bulletin or about the propriety or acceptability of a particular statement, advertising media, or use of information about your NVLAP accreditation status, please contact NVLAP before your publicity program is implemented.

Call 301-921-3431 or

Send your questions to:

Harvey W. Berger
Associate Manager, Laboratory Accreditation
National Bureau of Standards
ADMIN A531
Gaithersburg, MD 20899



U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET <i>(See instructions)</i>	1. PUBLICATION OR REPORT NO. 85-3140	2. Performing Organ. Report No.	3. Publication Date APRIL 1985
4. TITLE AND SUBTITLE Concrete LAP Handbook: Operational and Technical Requirements for the Laboratory Accreditation Program for Freshly Mixed Field Concrete			
5. AUTHOR(S) Robert L. Gladhill, Jeffrey Horlick, Wiley A. Hall, Jr., Harvey W. Berger			
6. PERFORMING ORGANIZATION <i>(If joint or other than NBS, see instructions)</i> NATIONAL BUREAU OF STANDARDS DEPARTMENT OF COMMERCE WASHINGTON, D.C. 20234 Gaithersburg, MD 20899		7. Contract/Grant No.	8. Type of Report & Period Covered
9. SPONSORING ORGANIZATION NAME AND COMPLETE ADDRESS <i>(Street, City, State, ZIP)</i>			
10. SUPPLEMENTARY NOTES <input type="checkbox"/> Document describes a computer program; SF-185, FIPS Software Summary, is attached.			
11. ABSTRACT <i>(A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)</i> This document explains the operation and technical requirements of the Laboratory Accreditation Program (LAP) for Freshly Mixed Field Concrete (Concrete LAP). All of the steps leading to accreditation are discussed. Technical requirements are explained indicating how the NVLAP criteria are applied. It is intended for use by staff of accredited laboratories, those seeking accreditation, other laboratory accreditation systems, and others needing information on the requirements for NVLAP accreditation under this LAP.			
12. KEY WORDS <i>(Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)</i> accreditation; assessment; concrete; laboratory; proficiency testing; testing; test methods			
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